IN THE CLAIMS:

Please amend the claims as indicated below.

1   (Previously Presented) A method comprising the steps of:
5   creating an evaluation model from at least one evaluation phone;
            creating a synthesizer model from at least one synthesizer phone;
            determining a matrix from the evaluation and synthesizer models, said
matrix configured for speech recognition;
            creating a new matrix by subtracting the matrix from an identity matrix.
10   determining an inverse of the new matrix; and
            determining acoustic confusability by using the inverse of the new matrix.

2.   (Original) The method of claim 1:
            wherein the at least one evaluation phone comprises a first plurality of
15   evaluation phones, the at least one synthesizer phone comprises a first plurality of
synthesizer phones; and
            wherein the method further comprises the steps of:
            creating a new matrix by subtracting the matrix from an identity matrix;
            creating an intermediate matrix comprising the new matrix and a second
20   identity matrix;
            determining a first set of specific elements of the intermediate matrix; and
            determining acoustic confusability from one of the specific elements.

3.   (Original) The method of claim 2, further comprising the steps of:
25   creating a second evaluation model comprising the first plurality of
evaluation phones and additional evaluation phones;
            creating a second matrix from the second evaluation model and the
synthesizer model;
            creating a second new matrix by subtracting the second matrix from a
30   third identity matrix;

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creating a second intermediate matrix comprising the second new matrix and a fourth identity matrix;

determining a second set of specific elements of the intermediate matrix, the specific elements corresponding to a column of the second intermediate matrix,

5   wherein the second set of specific elements comprise the first set of specific elements and a new set of specific elements; and

determining a second acoustic confusability by using previously performed calculations of the first set of elements and by calculating the new set of specific elements.

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4   (Original) The method of claim 1, wherein the evaluation model comprises a hidden Markov model of the at least one evaluation phone and wherein the synthesizer model comprises a hidden Markov model of the at least one synthesizer phone.

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5   (Original) The method of claim 4, wherein at least one of the hidden Markov models comprises a plurality of states and a plurality of transitions between states, wherein at least one of the transitions is a transition from one of the states to itself, wherein at least one of the transitions is a transition from one of the states to another of

20   the states, wherein each transition has a transition probability associated with it, and wherein each state has a probability density associated with it.

6.   (Original) The method of claim 5, wherein the plurality of states comprises a starting state, an ending state and an intermediate state, wherein the plurality

25   of transitions comprise:

a transition from the starting state to itself;

a transition from the starting state to the intermediate state;

a transition from the intermediate state to itself;

a transition from the intermediate state to the ending state; and

30   a transition from the ending state to itself.

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7.   (Original) The method of claim 1, further comprising the steps of:

creating a new matrix by subtracting the matrix from an identity matrix;

determining an inverse of the new matrix by the following steps:

creating an intermediate matrix comprising the new matrix and a second

5   identity matrix;

determining a specific entry of the second identity matrix that corresponds

to acoustic confusability;

determining a specific column or row in which the specific entry resides;

and

10   performing column or row manipulations to create a third identity matrix

in the new matrix while calculating only entries of the specific column or row in the

second identity matrix; and

selecting the specific entry as the acoustic confusability.

15 8.   (Cancelled).

9.   (Previously Presented) The method of claim 1, wherein the step of

determining acoustic confusability by using the inverse of the new matrix comprises the

step of selecting one element of the inverse of the new matrix as the acoustic

20 confusability.

10   (Previously Presented) The method of claim 1, wherein the step of

determining a matrix from the evaluation and synthesizer models comprises the steps of:

determining a plurality of product machine states; and

25   determining a plurality of product machine transitions between the product

machine states.

11   (Original) The method of claim 10, wherein:

each of the product machine states corresponds to one of the states of the

30 evaluation model and one of the states of the synthesizer model;

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each of the product machine transitions connects one of the product machine states to the same or another product machine state; and

a product machine transition exists when one or both of the following are true: a transition connects one evaluation model state with the same or another evaluation model state and a transition connects one synthesizer model state with the same or another synthesizer model state.

12 (Original) The method of claim 10, wherein the step of determining a matrix from the evaluation and synthesizer models further comprises the steps of:

determining a product machine transition probability for each of the plurality of product machine transitions; and

determining a synthetic likelihood for each of the product machine states.

13. (Original) The method of claim 10, wherein the matrix comprises a plurality of elements and wherein each element of the matrix corresponds to a potential transition between two of the product machine states.

14. (Original) The method of claim 13, wherein the step of determining a matrix from the evaluation and synthesizer models further comprises the steps of:

selecting an element of the matrix;

assigning a probability to the element if a product machine transition exists between two product machine states corresponding to a potential transition that corresponds to the element, else assigning a zero to the element; and

continuing the steps of selecting and assigning until each element of the matrix has been assigned.

15. (Previously Presented) A method comprising the steps of:

a) creating an evaluation model from a plurality of evaluation phones, each of the phones corresponding to a first word;

b) creating a synthesizer model from a plurality of synthesizer phones, each of the phones corresponding to a second word;

          c)   creating a product machine from the evaluation model and synthesizer model, the product machine comprising a plurality of transitions and a plurality of states;

          d)   determining a matrix from the product machine; and

          e)   determining acoustic confusability of the first word and the second word by using the matrix, said matrix configured for speech recognition.

16. (Original) The method of claim 15, wherein each of the evaluation and synthesizer models comprises a hidden Markov model

17. (Original) The method of claim 16, further comprising the step of determining synthetic likelihoods for each of the plurality of product machine states

18. (Original) The method of claim 17, wherein each synthetic likelihood is a measure of the acoustic confusability of two specific observation densities associated with the hidden Markov models of the evaluation and synthesizer models.

19 (Original) The method of claim 17, wherein the synthetic likelihoods are compressed by normalization.

20 (Original) The method of claim 17, wherein the synthetic likelihoods are compressed by ranking

21 (Original) The method of claim 17, wherein all synthetic likelihoods are determined through a method selected from the group consisting essentially of a cross-entropy measure, a dominance measure, a decoder measure, and an empirical measure

22   (Original) The method of claim 15, further comprising the steps of:

f)   performing steps (a) through (e) for a plurality of word pairs, each word pair comprising evaluation and synthesizer models, thereby determining a plurality of acoustic confusabilities; and

5   g)   determining acoustic perplexity by using the plurality of acoustic confusabilities.

23.   (Original) The method of claim 15 further comprising the steps of:

f)   performing steps (a) through (e) for a plurality of word pairs, each 10 word pair comprising evaluation and synthesizer models, thereby determining a plurality of acoustic confusabilities; and

g)   determining synthetic acoustic word error rate by using the plurality of acoustic confusabilities

15 24.   (Currently Amended) A method comprising the steps of:

a)   determining acoustic confusability for each of a plurality of word pairs, wherein step (a) further comprises the steps of, for each of the word pairs:

determining an edit distance between each word of the word pair; and

determining acoustic confusability from the edit distance; and

20   b)   determining a metric <u>for use in speech recognition </u>by using the acoustic confusabilities, wherein step (b) further comprises the step of determining an acoustic perplexity by using the confusabilities.

25.   (Cancelled)

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26   (Previously Presented) The method of claim 24 ~~25~~, further comprising the steps of:

c)   performing steps (a) and (b) to determine an acoustic perplexity of a base bigram language model;

30   d)   performing steps (a) and (b) to determine an acoustic perplexity of an augmented language model; and

e) determining gain comprising a logarithm of a fraction determined by dividing the acoustic perplexity of the augmented language model by the acoustic perplexity of the base bigram language model.

5 27. (Previously Presented) The method of claim 24, further comprising the step of:

c) minimizing acoustic perplexity during training of a language model.

10 28. (Original) The method of claim 27, wherein step (c) further comprises the step of maximizing a negative logarithm of the acoustic perplexity

29. (Original) The method of claim 24, wherein step (b) further comprises the step of determining a Synthetic Acoustic Word Error Rate (SAWER) by using the

15 confusabilities.

30. (Original) The method of claim 29, further comprising the steps of:

c) performing steps (a) and (b) to determine a SAWER of a base bigram language model;

20 d) performing steps (a) and (b) to determine a SAWER of an augmented language model; and

e) determining an improvement comprising a difference between the SAWER of the augmented language model and the SAWER of the base bigram language model.

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31 (Original) The method of claim 29, further comprising the step of:

c) minimizing the SAWER during training of a language model.

32 (Original) The method of claim 31, wherein step (c) further comprises the

30 step of maximizing one minus the SAWER.

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33.   (Original) The method of claim 29, further comprising the steps of:

c)   performing steps (a) and (b) to determine a SAWER for a vocabulary;

d)   augmenting the vocabulary with at least one additional word;

e)   performing steps (a) and (b) to determine a SAWER for the augmented vocabulary; and

f)   determining an improvement comprising a difference between the SAWER for the vocabulary and the SAWER for the augmented vocabulary

34.   (Currently Amended) The method of claim 33, further comprising the steps of:

g)   performing steps (d) through (f) for a plurality of additional words;

h)   determining a particular word of the additional words that has ~~the~~ a best improvement; and

i)   adding the particular word to the vocabulary

35.   (Original) The method of claim 24, wherein each of the words of the word pairs is represented by a hidden Markov model, and wherein step (a) further comprises the steps of:

creating a product machine for each of the plurality of word pairs, wherein each word each product machine comprising a plurality of states and a plurality of transitions determined by the hidden Markov models of a corresponding word pair; and

for each product machine, determining synthetic likelihoods for each of the plurality of product machine states

36   (Original) The method of claim 35, wherein each synthetic likelihood is a measure of the acoustic confusability of two specific observation densities associated with the hidden Markov models of the corresponding word pair

37.   (Original) The method of claim 35, wherein the synthetic likelihoods are compressed by normalization.

38   (Original) The method of claim 35, wherein the synthetic likelihoods are compressed by ranking.

5   39.   (Original) The method of claim 35, wherein all synthetic likelihoods are determined through a method selected from the group consisting essentially of a cross-entropy measure, a dominance measure, a decoder measure, and an empirical measure.

40   (Original) The method of claim 35:

10   wherein step (a) further comprises the step of, for each acoustic confusability:

determining a matrix from a corresponding product machine; and

determining an inverse of a second matrix created by subtracting the matrix from an identity matrix; and

15   wherein each hidden Markov model comprises a plurality of phones;

wherein a larger word and a smaller word have an identical sequence of phones;

wherein the larger of the two words comprises an additional set of phones; and

20   wherein a set of calculations performed when determining the inverse of the matrix for the smaller word is cached and used again when determining the inverse of the matrix for the larger word.

41.   (Cancelled)

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42.   (Previously Presented) The method of claim 24, wherein the edit distance is determined by determining a number of operations and a type of each operation to change one word of the word pair into the other word of the word pair.

30   43.   (Original) The method of claim 42, wherein the operations are selected from the group consisting essentially of deletions, substitutions and additions of phones.

44.   (Original) The method of claim 42, further comprising the step of weighting each operation.

5   45.   (Original) The method of claim 42, further comprising the step of assigning a cost to each operation.

46   (Currently Amended) A method for determining acoustic confusability of a word pair, the method comprising the steps of:

10   determining an edit distance between each word pair and an associated alignment;

          assigning acoustic distances to each aligned phoneme pair; and

          determining an acoustic confusability for use in speech recognition by summing said acoustic distances.

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47   (Currently Amended) The method of claim 46, wherein the edit distance is determined by determining a number of operations and a type of each operation to change one word of the word pair into the other a second word of the word pair

20   48   (Original) The method of claim 47, wherein the operations are selected from the group consisting essentially of deletions, substitutions and additions of phones.

49   (Original) The method of claim 47, further comprising the step of weighting each operation.

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50.   (Original) The method of claim 47, further comprising the step of assigning a cost to each operation.

51   (Previously Presented) An apparatus comprising:

30   a memory that stores computer-readable code; and

a processor operatively coupled to said memory, said processor configured to implement said computer-readable code, said computer-readable code configured to:

create an evaluation model from at least one evaluation phone;

create a synthesizer model from at least one synthesizer phone;

5   determine a matrix from the evaluation and synthesizer models;

create a new matrix by subtracting the matrix from an identity matrix

determine an inverse of the new matrix; and

determine acoustic confusability by using the inverse of the new matrix

10   52   (Currently Amended) An apparatus comprising:

a memory that stores computer-readable code; and

a processor operatively coupled to said memory, said processor configured to implement said computer-readable code, said computer-readable code configured to:

a)   determine acoustic confusability for each of a plurality of word

15   pairs, wherein step (a) further comprises the steps of, for each of the word pairs:

determining an edit distance between each word of the word pair; and

determining acoustic confusability from the edit distance; and

b)   determine a metric for use in speech recognition by using the acoustic confusabilities, wherein step (b) further comprises the step of determining an

20   acoustic perplexity by using the confusabilities.

53   (Cancelled)

54.   (Previously Presented) The apparatus of claim 52, wherein the computer-

25   readable code is further configured, when performing step (b), to determine a Synthetic Acoustic Word Error Rate (SAWER) by using the confusabilities.

55.   (Currently Amended) An apparatus for determining acoustic confusability of a word pair, the system comprising:

30   a memory that stores computer-readable code; and

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a processor operatively coupled to said memory, said processor configured to implement said computer-readable code, said computer-readable code configured to:

determine an edit distance between each word pair and an associated alignment;

5   assign acoustic distances to each aligned phoneme pair; and

determine an acoustic confusability for use in speech recognition by summing said acoustic distances

56.   (Previously Presented) An article of manufacture comprising:

10   a computer-readable medium having computer-readable code means embodied thereon, the computer-readable program code means comprising:

a step to creating an evaluation model from at least one evaluation phone;

a step to creating a synthesizer model from at least one synthesizer phone;

a step to determining a matrix from the evaluation and synthesizer models;

15   a step to create a new matrix by subtracting the matrix from an identity matrix.

a step to determine an inverse of the new matrix; and

a step to determine acoustic confusability by using the inverse of the new matrix.

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57   (Currently Amended) An article of manufacture comprising:

a computer-readable medium having computer-readable code means embodied thereon, the computer-readable program code means comprising:

a)   a step to determine acoustic confusability for each of a plurality of

25   word pairs, wherein step (a) further comprises the steps of, for each of the word pairs:

determining an edit distance between each word of the word pair; and

determining acoustic confusability from the edit distance; and

b)   a step to determine a metric for use in speech recognition by using the acoustic confusabilities, wherein step (b) further comprises the step of determining an

30   acoustic perplexity by using the confusabilities

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58.   (Cancelled)

59.   (Original) The article of manufacture of claim 57, wherein the computer-
readable program code means further comprises, when performing step (b), a step to
5   determine a Synthetic Acoustic Word Error Rate (SAWER) by using the confusabilities

60.   (Currently Amended) An article of manufacture for determining acoustic
confusability of a word pair, the article of manufacture comprising:

a computer-readable medium having computer-readable code means
10   embodied thereon, the computer-readable program code means comprising:

determine an edit distance between each word pair and an associated
alignment;

assign acoustic distances to each aligned phoneme pair; and

determine an acoustic confusability for use in speech recognition by
15   summing said acoustic distances.

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